

5: Castetter & Bell N-5 (1938-1940) 1942

NU28 Papago NUA28

Pima NUA29

EARLY BASIS OF PIMAN SUBSISTENCE

51

which they depended wholly for support. In 1919 it was estimated that the aggregate cattle holdings of the desert Papago were about thirty thousand head.⁴⁸ As late as 1846 the Pima were reported as having few cattle and these only for tillage.⁴⁹

The modern Pima have profited greatly by the introduction of cattle; today they not only raise cattle for their own use, but more commonly rent their lands for pasturing cattle owned by the whites. The grazing of custom cattle by the Pima has steadily grown since November, 1932, when six hundred were secured from the Tremaine alfalfa ranch. In 1935 approximately 55,000 such cattle were on the Gila River Reservation, and during the winter months of the same year about twelve hundred sheep also were pastured there. Many of the Pimas now work for hire, as is true with the Papago at San Xavier, at Tucson and the copper mine at Ajo. Individuals of both groups eke out an existence or supplement their meagre income by cutting and marketing dead wood. Beginning in 1933 marked stimulus was given toward acculturation, particularly among the Papago, by the appropriation of emergency conservation funds. This is having far-reaching effects upon Papago as well as Pima economy and culture; it is transforming Papago economy from a gift and barter to a money basis and gradually raising their standard of living.

• • •

It would be highly desirable to present an accurate statement of the amount of land anciently cultivated per family among Pima and Papago as well as the total amount of crops and wild food used annually per family or per person. Due to cultural disturbances and distortions, however, it is now very difficult to arrive at exact figures. Moreover the ratio between cultivated and wild foods utilized fluctuated con-

⁴⁸ Curtis, *The American Indian*, II, 31; *Report of the Commissioner of Indian Affairs for 1904*, p. 149; *ibid.* for 1919, p. 287.

⁴⁹ Emory, *Notes*, pp. 83-5.

Considerably from year to year, and the areal variability of soils and climate entered in. Thus the Papago village of Vamori was reported by Clotts⁵⁰ as having a cultivated acreage of 7.03 per person, but considerable allowance must be made for the fact that the fields there had quite poor soil. The Papago habit of seasonal movement between Wells and Fields and their migration to the Gila and the Altar to work for hire always has rendered difficult the obtaining of reliable population figures. Thus the reports of the Commissioner of Indian Affairs⁵¹ beginning in 1863 variously recorded the Papago population of Pimería Alta as follows:

Year	Population	Year	Population
1863	7500	1885	7300
1865	5000	1895	2648
1872	6000	1903	2542
1875	6000	1911	about 5000
1883	7300		

Population on the reservation at San Xavier was reported as follows:

Year	Population	Year	Population
1865	(80 families)	1893	427
1882	250	1895	517
1883	500	1896	542
1885	250	1899	502
1887	137	1900	519
1890	363	1903	523

In 1858 Chapman's census listed the number of Pimas on the Gila as 4,117; in 1914 the number on the reservation at Sacaton was 3,796.⁵² Part of the discrepancy in the above figures is due to allottees only being included in some cases, in others all the inhabitants of the reservation.

⁵⁰ Clotts, *Nomadic Papago Surveys*, p. 80.

⁵¹ Report of the Commissioner of Indian Affairs for 1863, pp. 385, 390; *ibid.* for 1865, pp. 135, 589; Clotts, *History of the Papago Indians*, etc., pt. III.

⁵² Report of the Commissioner of Indian Affairs for 1858, pp. 354-60; *ibid.* for 1914, p. 77.

5: Castetter & Bell N-5 (1938-1940) 1942

NU28 Papago NU28

Pima NU29

EARLY BASIS OF PIMAN SUBSISTENCE

53

In 1878 the Papago were reported as cultivating 2,500 ^{Pa} acres of land and as having grown six thousand bushels of ¹⁷⁴ wheat, five hundred of corn and three hundred of oats and ³¹¹ barley. More directly to the point is a careful survey of 1914³³ made in an effort to determine the Papago population, and the figures presented were regarded as quite reliable. Exclusive of the San Xavier and Gila Bend reservations, the Papago population that year was reported as 5,662. This survey has particular significance for our purpose since it also reported that these desert Papago cultivated by flood-water farming 9,177 acres of land (and had from fifteen thousand to thirty thousand cattle). Clotts therein listed a large number of settlements, giving data on population and acreages; but considering only those forty-seven villages for which he presents both population and amount of land cultivated, the average acreage per person was 1.79. The lowest per person was .08 at Copperosity, the winter home for the summer village of Anegam, the former site of which was Omik-Vaxia (Salt Well); the highest, 7.03 at Vamori where the soil is of poor quality. Information given us by old Papagos indicates that in the days of their fathers and grandfathers the cultivated acreage per family in their villages ranged from one-fourth to a maximum of two acres. Chico Bailey informed us that, as a young man, he planted for his own family a plot of corn fifty by seventy-five yards (approximately three-fourths of an acre); José Petero stated that in his boyhood the average family had, in addition to their corn, reparies and pumpkins, a wheat field covering about a half acre.

Our Pima informants stated that in the days of their ^{Pi} grandfathers most families cultivated from one to five acres ¹⁷⁴ although a big land owner might have as much as twenty, ²⁴¹ ³¹¹ much of which was secured by inheritance. Size of Pima farms was reported in 1871 as averaging from ten to fifteen ¹⁷⁴

³³ *Ibid.* for 1878, p. 298; Clotts, *Nomadic Papago Surveys*, p. 80.

gelin⁸⁰ finds Kroeber's estimate of one acre of cultivated land ^{Pi} per person much too high at least for the Shawnee during the ^{Pa} eighteenth and nineteenth centuries, but does not dispute ¹⁷⁴ his figure of fifteen to twenty bushels of corn necessary to ²⁴¹ support one person for one year. Accepting the weight of fifty-six pounds of shelled corn per bushel (Pima-Papago corn averages three to four pounds less), Kroeber estimates that one thousand pounds of corn (in round numbers the annual yield of one acre, about eighteen bushels), or a little less than three pounds per person per day, should more than sustain the average person in a community composed of men, women and children.

Under early conditions Piman native corn yielded on the average only ten to twelve bushels of shelled corn per acre, although as grown by the U. S. Field Station on the reservation at Sacaton the same corn yields twenty to twenty-five bushels; teparies, under native conditions, five hundred to eight hundred pounds per acre—under Field Station cultivation, as high as fifteen hundred pounds; and wheat, an introduced crop, ten to twenty bushels with native culture, and forty to fifty bushels at the Station.

In our judgment the figure of 1.79 acres of cultivated ^{Pi} land per person as derived from the data of Clotts⁸¹ is too ^{Pa} high when applied to the whole desert Papago area. Our ¹⁷⁴ most reliable figures indicate that the desert Papago, before ²⁴¹ white contact disturbed their economic pattern, cultivated ²⁶² from one-fourth to a maximum of two acres per family. Allowing an average of twelve bushels an acre, this means a crop of about three to twenty-four bushels of shelled corn, or its equivalent in teparies and pumpkins, per family. Assuming a family size of five, this would allow about three-fifths to five bushels per person per year. In terms of Kroeber's subsistence level (eighteen bushels per person per year),

⁸⁰ Voegelin, *The Place of Agriculture in the Subsistence Economy of the Shawnee*.

⁸¹ Clotts, *op. cit.*, p. 80.

Pi this would indicate the desert Papago cultivated food supply
 Pa ranged approximately from one-thirtieth of the annual food
 194 consumption among some families to one-third of the total
 241 among others. Actually, however, the figure was somewhat
 311 less because of several factors: (1) On Papago cultivated plots
 262 not all the land was level and therefore portions of it were not
 tillable since they could not be flooded. This was particularly
 true at points where water entered fields and deposited silt;
 (2) Papago (and Pima) ate a large fraction of their corn crop
 in the roasting-ear stage and this reduced its actual yield in
 terms of total food value. This practice has rendered it very
 difficult to compute yield of maize per acre; (3) it was cus-
 tomary for Papago (and Pima) to gorge themselves when food
 was abundant, with little providence for the future. This
 resulted in such an inequable distribution of the crop that
 frequently this entire food supply was eaten up by the end
 of December.

On the above basis, our field and historical studies of the
 Pima level of economy from the standpoint of their agricul-
 ture indicate that anciently the cultivated acreage per Pima
 family was two to five acres. In arriving at this figure we are
 guided somewhat by the amount of land it was possible
 physically for a family to cultivate with primitive imple-
 ments. Again assuming an average family size of five, we
 arrive at a figure of two-fifths of an acre to one and one-fifth
 acres per person, or five to fifteen bushels of corn or its equiva-
 lent per person per year. This would mean the cultivated
 crop supplied approximately from one-fourth of the total
 food requirements among some families to nearly the entire
 amount among others.

Pi The conclusion we are forced to draw from our own field
 194 studies, as well as historical accounts as to the ancient basis of
 241 Pima subsistence, is that, before white contact radically dis-
 311 turbed the economic pattern, the Pima cultivated crop in
 262 average years comprised about 50 to 60 per cent of the total

food supply, wild plants and animals constituting the remainder; thus food gathering was absolutely necessary to supplement the inadequate cultivated crop. Our estimate is supported by Russell's⁸² statement made forty years ago that mesquite constituted nearly, if not quite, the chief native article of Pima diet in primitive times; also by that of Whittemore⁸³ that mesquite beans were the principal article of Pima food. Mesquite was a dependable food and the Pima ate it in abundance every year. Their aboriginal crops were maize, beans, pumpkins, cotton and gourds. In years of inadequate water supply or crop failure from other causes they were forced to rely even more heavily upon wild plant and animal foods. Their strong reliance upon wild foods, chiefly mesquite and sahuaro fruit, supplemented by screwbean and cholla buds and fruits on the plant side; plentiful jackrabbits and less numerous deer and mountain sheep, as well as fish (although they had less access to fish than did the Colorado River peoples) and beaver on the animal side, bespeaks that agriculture was not overwhelmingly their basis of food supply. Wild plant products had a much more important place in their diet than did game, the ratio being about three to one. Apart from the killing of rabbits, hunting never constituted a major occupation, but a hunter would usually get about a half dozen rabbits in a day's hunt.

On the basis of our similar studies among the Papago, it is possible to conclude that anciently these Indians in average years cultivated only about one-fifth of their total food supply, four-fifths consisting of wild plant and animal products, supplemented by such variable amounts of cultivated food-stuffs as were secured from the Pima and their relatives in the San Pedro and Altar valleys in exchange for labor. In years of poor crops the balance was shifted even further in the direction of native wild foods and reliance upon these relatives and friends.

⁸² Russell, *op. cit.*, p. 74.

⁸³ Whittemore, *op. cit.*, p. 34.

Pa. Papago utilized considerably more native plant food than
 194 wild animal life, the ratio being approximately four to one;
 241 also more deer and less rabbits than did the Pima. These
 311 native plant foods were mainly sahuaro and organ-pipe cactus
 242 fruit, cholla buds and fruit, mesquite beans, seeds of iron-
 wood and paloverde, certain greens and sand root. Several
 months of every year were spent by the women gathering
 and preparing wild plant foods, and every family spent three
 or four weeks in late June and July gathering sahuaro, the
 women doing the gathering and preparing the fruit, the men
 guarding camp and hunting rabbits and rats. Among animals
 their reliance was upon deer, and, in diminishing order,
 rabbits, antelope, mountain sheep, rats and larvae. A family
 group formerly had no more than one or two hunters, each
 killing about twelve to fifteen deer per year. Many families
 had no hunter, so the kill was distributed among the entire
 economic unit with which they were affiliated, ranging usually
 from two to ten families.

Pa. Thus it is obvious that in normal years of crop production
 Pi. the Papago made much more extensive use of wild products
 174 than the Pima. In comparison with the Maricopa the Pima
 241 depended appreciably more upon cultivation and less upon
 wild products than did these neighbors on the Gila, to whom
 mesquite and screwbean are reported as more important than
 maize.⁶⁴ Bartlett⁶⁵ wrote in the middle of the last century
 that Leroux had ascertained the Pima were much better
 supplied with corn and every other commodity than were the
 Maricopa. The stronger emphasis upon agriculture by the
 Pima as compared with the Maricopa is attested also by the
 presence of extensive canal irrigation, while the Maricopa
 depended entirely upon the inundation of flood plains and
 sub-surface seepage.⁶⁶

Although the agriculture of the Gila Pima and the Papago

⁶⁴ Spier, *Yuman Tribes*, pp. 48, 58-9.

⁶⁵ Bartlett, *Narrative*, II, 251.

⁶⁶ Spier, *loc. cit.*

CHAPTER V

SELECTION, DEVELOPMENT AND OWNERSHIP OF LAND

SELECTION AND LOCATION OF CULTIVATED LAND

- 134 Selection of land by the Gila Pima did not present a
● 1c difficult task, for the bottomlands of this river rather gener-
● 1a ally consisted of fertile soil, the main problem being to choose
● 311 land which could be irrigated easily from the canals yet was
134 not too low to drain readily. The soil at Sacaton is of uniform
texture to a considerable depth, a sandy loam composed
largely of fine sands and silt from the weathering of adjacent
mountains. When first cleared of native vegetation it is
deficient in organic material, although the large quantity of
silt increases the water-holding capacity, and it responds very
readily to methods of improvement. This soil is representa-
tive of considerable areas extending in narrow strips along
the Gila, which are well adapted for farming when not im-
pregnated with soluble salts.¹

Comparatively little choice was exercised by the Pima in selecting soil either in general or for particular crops, although sandy soil was preferred for watermelons. Good land was indicated by its black color and a vigorous growth of wild plants, and these Indians, of course, knew that such soil was richer and had greater water-holding power than soils of lighter color, and that corn, for example, would have smaller ears on light, sandy soil. Practically the only additional caution to be observed in soil selection was the avoidance of land high in salinity. The Papago were little troubled with this, but the bottomlands of the Gila (and Salt) were in places heavily impregnated, a common characteristic of irrigated soils. This was observed on the Gila even in Mange's

¹ King, *Crop Tests at the Cooperative Testing Station*, pp. 7, 9.

day, for he wrote that, continuing from Casa Grande toward ^{Pa} the west, it appeared as though the land had been strewn ^{Pa} with salt.² In 1871 Grossmann³ noted that some of the soil on ³¹¹ the reservation was strongly impregnated with salts. How-¹³⁴ ever, the Pima have long coped with the problem of salinity by repeated flooding of such land with muddy water to wash out this mineral content, and, more recently, by working manure into the soil (taught by the whites). The fact that the Pima have irrigated the bottomlands of the Gila for centuries, without finding it necessary to abandon any large sections of land due to accumulation of salts, bespeaks their ancient knowledge of how to manage the fields from this standpoint. Informants recognized saline soil by: (1) The appearance of a white incrustation on the surface; (2) tasting the soil; (3) a growth of saltbush (*Atriplex*); (4) the sticky nature of such soil when wet, and (5) that such soil creaked when one walked on it. They also knew that deposits of salts are more abundant on high spots than in lower portions of a field; that their native crops and wheat would not do well but that muskmelons would do better on saline soil than many other crops. Seeds of various crops would germinate in such soil and grow for a time, but would either die before reaching maturity or not yield a harvest. As wheat is a winter crop in the Pima area, consequently requiring less irrigation, it often can be grown successfully on soils of higher salinity than most summer crops would tolerate.

Tests at the Cooperative Field Station⁴ recently have ^{Pa} shown that the alluvial soil in the vicinity of Sacaton is ^{Pa} adapted to many kinds of truck crops, provided the concen-¹³⁴ tration of salts is not too great. Also, that by turning under heavy applications of farmyard manure and cover crops, followed by growing alfalfa on the land for two or three years, it is possible to reduce the salinity to a large extent. The

² Minge, *Loc. cit.*, p. 233.

³ Grossmann, *The Pima Indians of Arizona*, p. 418.

⁴ King and Loomis, *Agricultural Investigations*, p. 19.

Pa
Pa
B4 organic matter and deeply growing roots of alfalfa result in
looser structure and texture of the soil, making it more permeable to water and thus permitting leaching of the salts to lower levels.

The Gila Valley contains large areas covered with white incrustations of salts deposited by the evaporation of water reaching the surface from beneath. A comparison of the total salt content of surface flow with that of the underflow indicates the former contains salts varying from 39.4 to 120.2 parts per 100,000 of water, with an average of 96.3; the salt content of the underflow varies from 68 to 160 parts in 100,000 with an average of 126.6. Nevertheless the underground water at Sacaton is regarded as better for irrigation than the average surface water of the river. Examples of successful irrigation by waters more saline than the Gila underflow are numerous.⁵

- Pa A Papago village was invariably a settlement of kin, and
- 311 others entered it only by invitation or marriage. The three
- 36/ Papago reservations comprise eleven village units, the location of which has changed very little since Kino first visited them.⁶ The determinant reason is ecological, for they were located in spots which were then, as now, the most suitable for cultivation. Usually the main villages are situated in the north-to-south valleys, their daughter villages extending along the valley in both directions, and their Wells, or winter villages, located in the foothills on either side of the valley.

Pa Soil in the Papago country is principally adobe, ranging
B4 from hard compact stretches, resulting from the first decomposition of lava near the mountains, to finer deposits mixed with decomposed vegetable matter on the floor of the broad valleys. With few exceptions, such as near meridian 112 at the Mexican line, where there is light, loose sand, the soil of the valley bottoms is fairly rich.⁷

⁵ Lee, *Underground Waters of Gila Valley*, pp. 61-2.

⁶ Underhill, *Papago*, p. 58.

⁷ Clottis, *Nomadic Papago Surveys*, p. 3.

5: Castetter & Bell N-5 (1938-1940) 1942

NU28 Papago NV28

Pima NV29

SELECTION, DEVELOPMENT, OWNERSHIP

105

Papago farming plots were almost without exception ^{Pa} located at the mouths of washes,^a where they could be watered ³¹¹ by flood water of the summer rains, and groups of relatives camped for generations at the same washes. In the Papago country every suitable plot of ground of this kind was utilized, and in many cases the plantings were necessarily very small. These pieces of alluvial land had few or no stones, and any found there were carried away in baskets to the edge of the field. They were not very particular as to type of soil, unless it contained considerable salts, for the deciding factor was the ease with which the land might be flooded during rains. Nevertheless these Indians knew that a good growth of weeds or the presence of large mesquite or paloverde trees indicated a good soil.

CLEARING THE LAND AND LAND OWNERSHIP

Since Papago land was selected primarily on the basis of ^{Pi} its being subject to inundation by flood water, and tended to ^{Pa} have a sparse cover of grass, it did not have heavy stands of ²⁴¹ trees or shrubs. With primitive implements it was extremely difficult for either Pima or Papago to clear land of heavy growths of vegetation. Brush was first trampled, then allowed to dry, and burned, after which the roots were grubbed out with the planting stick and weeding hoe. Burning of any vegetative matter was thought to improve the fertility of the soil. Trees were known to interfere with the growth of cultivated plants because of their shade and extensive root systems, and were killed by burning brush in a shallow trench dug around the butt, never girdled mechanically. Dead trees might be allowed to stand in the cultivated fields, but usually were completely destroyed by continued burning.

Clearing new ground or old plots of weeds and debris in preparation for planting was men's work, in which women of

^a As used here a wash means a broad alluvial area over which the water, flowing down from the mountains in periods of rain, loses its momentum and spreads out.

ADVANTAGE OF AN ARID COUNTRY 27

It has been the good fortune of the Papagoes to live 177
in a country which the white man as yet has not found
it profitable to exploit by cattle raising or, still less, by
dry farming. Therefore, they have so far been left alone
in their native country, and besides they have even come
into possession of a few wells which the Americans dug
in their efforts to redeem the land. These natives are
thus better situated than most of the tribes of North
America.

The Papagoes are above medium height, rather dark 142
in color, and of splendid physique. The women are in-
clined to be stout. They are a peaceful but at the same 181
time courageous people and show much intelligence.
They are hospitable, as becomes a desert people, and if 574
food is being prepared in the house when a stranger
comes, some of it is offered to him, be he Indian, Mexi-
can, or American.

In the central part of the Papaguera, especially in 177
the large valley of Santa Rosa and the adjacent Quijotoa 182
and Comobabi ranges, they live happy days without
much interference from the whites. Some of the sum- [31]
mer rancherias astonished me by their extent of land
fenced by wooden piles and poles, but in outlying dis-
tricts many are forced to seek work from the whites, by
whom they are much valued as laborers in the making
of railroads, irrigation ditches, and in mining. The part
of the tribe that lives in Sonora is much more disrupted;
they have lost most of their lands and are largely ser-
vants of the Mexicans, doing efficient work as *vaqueros*
(cowboys), miners, etc. The Papagoes also know how 177
to "dry wash" gold at the placer mines, many of which 316

175 It was the Sobaipuris for whom and by whom the Spanish missions were built. The picturesque and well preserved San Xavier Mission, about nine miles south of Tucson, was built at the largest village, Bac. The others were located at Guvavi, about nine miles north of Nogales, and at Tumacacori, midway between.

Fleeing before the ravaging Apache early in the nineteenth century, the Sobaipuris abandoned their villages and the missions, and took refuge among the Papago, with whom the tribe merged and lost its identity. The last one of the known Sobaipuri braves died in Tucson in March, 1932.² The present village at San Xavier was settled by Papago at a later date.

ECONOMIC ADJUSTMENTS TO THE LAND

132 Water, or rather its absence, is the critical factor or resource of the
312 Papageria; limiting in turn habitable sites where water may be had for domestic purposes; limiting the economically useful vegetation to short lived annuals and low scattered xerophytic perennials suited to limited grazing; severely restricting the tillable lands in spite of extensive areas of flat land with deep fertile soils of the lime accumulating type. The rainfall varies from less than five inches in the west to as much as eighteen inches or more in the Baboquivari Mountains.

241 In recompense, the aridity has afforded a degree of security, for the
648 area has offered little to hostile marauding Indians, or even to the covetous
● 311 white man. Few white families could make a living on as much of this land as may support an entire Papago village. The very poverty of his land has been the Papago's guarantee, and his peaceful record is in large part due to the fact that he has had comparatively little provocation or interference. A high degree of adaptation through centuries of adjustment, combined with a low standard of living, have made it possible for over 5,000 Papago to live on about 5,000 square miles of this region, desertic both in climate and resources.

241. The Papago are the premier dry farmers, producing wheat on driest lands where it is known to be successfully grown, with as little as five inches of rainfall or less.³ Some years the crop fails entirely, for the rains do not always come. But yields as high as twenty-five bushels to the acre have been grown. A good harvest will furnish wheat enough to last several years, and the Papago have learned the wisdom of keeping a reserve on hand.

² The Arizona Republic, March 16, 1932, p. 1.

³ Carl Sauer and Donald Brand, *Prehistoric Settlements of Sonora*, with Special Reference to Cerros de Trinchera (University of California Publications in Geography, Vol. 5, No. 3, 1931), esp. p. 75.

18: Kelly

NU28 Papago NU28

241

● 311

312

[For author's suggestions on expanding Papago irrigation agriculture, see category 116,
pp. 90-93.]

175
177 Mexico gained its independence in 1821, Papagos from Sonora sometimes fled northward into what is now Arizona, introducing Spanish ways acquired during their longer and more intensive contact with non-Indians. The Gadsden Purchase, 175
648 which added the lands south of the Gila River to the United States in 1853, resulted in the Papago Indians losing their Mexican citizenship, without gaining full United States citizenship. Their lands were considered at that time as available for white settlement, and many springs, wells, and grazing areas were soon claimed by ranchers moving into the area. The seriousness of the trespass was not recognized in early pioneer days with respect to the vast desert areas west of Tucson. The situation was different, however, with respect to the compact settlement of Indians around the San Xavier Mission and, for this group, a reservation was established in 1874 by Executive Order. By this means about 70,000 acres of land near the Santa Cruz River were protected from white encroachment. When much of the area [423]
[311] was allotted to individual Indians in 1890, 1,580 acres were reported to be under irrigation and an additional 6,440 acres were considered suitable for farming if water could be made available; the remaining acreage was suitable only for grazing.

175 About this same time, the 1880's and 1890's, a burst of mining activity (in the area of the present main reservation) brought a rapid development of many new wells and the improvement of old ones, to supply the towns that

quickly grew up at such locations as Quijotea (Covered Wells), Alamo, and San Antone (formerly Weldon, with a population said to have reached 11,000 at one time). One by one the mines were worked out or failed, and although the mining communities were rapidly deserted, the improvements to the water supply enabled Papagos to occupy the locations advantageously wherever elaborate well machinery was not needed.

After the Civil War, the combination of growing Papago herds and numerous ranches established by white settlers resulted in substantial increase in the stock grazed in the area now included in the Papago Reservation. Papago "depredations" in the 1890's caused some ranchers to abandon the area, their losses being alleged to have been \$300,000 in stock and improvements. Lumholtz reported in 1909 that several Papago stock men had herds of about 200 cattle and 50 horses, in excellent condition, in the western slopes of the Baboquivari Range. Nevertheless, Indian cattle-men and farmers were not secure in their land and numerous large tracts were held by non-Indians.

A complete history of the establishment of the three Papago reservations is provided by a Bureau of Indian Affairs report (1944):

"The first reservation for the Papago Indians was established at San Xavier on July 1, 1874, and the second at Gila Bend on December 12, 1882..... An Executive Order of June 17, 1909, reduced the size of the Gila Bend Reservation.

Soil and Erosion. Since farming and stock raising are important means by which the Papagos use the resources of their reservation, the nature and especially the present condition of their soils is of great importance. The soils of the area include much fine alluvial material, and frequently have only very sparse coverage of vegetation. Much of this cover has been reduced by overgrazing, and even before the introduction of stock there were numerous areas where heavy summer showers or the frequent strong winds of the dry spring period caused substantial erosion. By no means all of this could be prevented, but increased erosion within the past century has seriously interfered with flood water farming by cutting deep gullies where water formerly spread out on alluvial plains and by depositing coarse unsorted material on top of cultivable land.

Periodic surveys of the reservation have recorded the extent and severity of erosion (see Soil Conservation Program, 20-Year Period). Wind erosion is particularly serious in the lighter soils of the Chukut Kuk, Pisinimo, Schuk Tonk, and Sif Oidak districts. All districts have extensive gully erosion on steeper slopes. Sheet erosion on flatter areas occurs particularly in Baboquivari, Gu Achi, and Nickiwan districts. Nearly half of the 10,297 acres of the Oila Bend Reservation are classed as showing Severe or Critical erosion. About a third of the San Xavier Reservation (25,210 out of 71,090 acres) are Severe or Critical.

134 On the main Papago Reservation, erosion is reported as follows:

Slight	193,534
Moderate	1,183,840
Severe	1,160,960
Critical	<u>225,800</u>
	2,774,534

The individual districts, arranged in descending order of magnitude, are reported in Table 2. It is apparent from these figures and from a 1948 map of erosion conditions on the reservation, that large relatively flat areas in Schuk Toak District (especially on the southwest side of Aguirre Wash), in Gu Achi and Sif Oidak Districts (along Santa Rosa Wash), and in Chukut Kuk District are critically eroded, together with smaller areas in Solis, Baboquivari, and Pisinimo. Severe erosion is present in nearly all parts of the reservation, and the moderate or slight erosion areas tend to be concentrated in the central, southeast, and extreme northwest parts of the reservation.

Both in order to increase grass for forage and to control erosion, extensive areas have been provided with earth dams and with spreader dikes designed to distribute water more evenly and reduce the rapid and damaging runoff from summer storms. Nevertheless, erosion continues to be a serious problem and its effects limit both carrying capacity for stock and possibilities for flood water farming.

312 except in the southwest quarter of the reservation and other small areas where the fluoride content is greater than 1.5 parts per million, the maximum suggested for domestic use (Heindl, p. 22).

175
312

Reservation Water Development. Prior to the systematic and extensive drilling of deep wells in the Papagueria, the Indians depended, during the long winter and spring period, upon a few widely scattered tanks and springs, which tapped small portions of the ground water supply. In some instances, shallow wells were dug to supplement natural water sources near the winter villages. During the summer and fall, at least, man-made catch basins (charcos) could be depended upon to hold a supply of water originating from run off from the heavy summer thunderstorms.

The brief and intensive period of mining activity in the late 19th Century was marked by the first large-scale use of ground water. Numerous relatively deep wells were dug or drilled, some of them continuing to supply Papago villages after the mining ventures came to an end. Nevertheless, wells remained few, more important for limited domestic use than to support the large numbers of cattle and horses grazed on the Reservation.

175
312
659
311

The first large-scale program of water development by the Bureau of Indian Affairs was in the middle 1930's. At that time 36 wells, 18 dams, 41 masonry storage

tanks, and 76 earth-walled tanks (charcos) were built. Water thus supplied not only permitted the year-round use of the range but permitted cattlemen to place their cattle in areas formerly not usable because of lack of water. Nevertheless, it was reported as late as 1949 that "only 40% of the Papago range is now within reach of permanent stockwater" (The Papago Development Program, 1949, p. 30). This situation, of course, tended to accentuate the overgrazing of areas with a better water supply.

From 1953 until the termination of the program in 1958, the Papago Development Program expended \$1,041,181 on stockwater development, including not only wells, but windmills, power pumps, dams, storage tanks, and similar construction. During this same time deep wells were drilled to supply water for the Chuichu farm development.

Since 1958, with the completion of the well drilling program, emphasis has been upon range development and soil and moisture conservation. During the past five years, to June 30, 1963, about \$500,000 has been expended for these purposes, mostly in the construction of detention dams.

At the present time there are 23 irrigation wells operating on the main reservation and at San Xavier. In addition there are 160 wells for domestic and stock water use, on the main Papago Reservation, six at San Xavier and two at Gila Bend.

175
233

an irreducible minimum, cattle are brought to a state bordering on starvation. Sometimes quite a number die. It is at this time that the cattle can be seen eating the choya (cholla) with its protection of numberless spines which attach themselves to the mouth, nose and even ears and must be carried around until brushed off. The choya has considerable water and food value if it could be eaten."

175
233
● 311

Glotts' figures not only indicate the intensity of development of stock raising, but, as shown on Map 7,² make clear its general distribution on the reservation. There is a conspicuous concentration along the Vamori and Santa Rosa washes, with very little development in the northeast and northwest areas. The map is based on the residence of owners, however, and thus does not show where the cattle are actually grazed. Vamori owners, for example, are known to have had large numbers of cattle in the foothills of the nearby Baboquivari Mountains.

Probably the only reliable estimate of the number of cattle held by the Papago prior to 1950 is given by Gwyneth [422] Harrington for 1937. In that year, with the help of Indian informants, she secured the number of cattle held by owners in each of the villages of the Baboquivari and Chukut Kuk districts. The total for Baboquivari was 5,100 head, and for Chukut Kuk, 5,880, making a total for the two districts of 10,980. Comparing these figures with estimates made by the Bureau of Indian Affairs for the other districts of the reservation she estimated that 44.9 per cent of all Papago
²[see map on p. 78-B₁, B₇, B₈ B₃--Analyst]

cattle were held in her two districts, and that the total cattle population on the reservation was about 25,000.

175
233
[311] ●

It is reasonable to assume from this and other evidence that the period of heavy grazing on the reservation was between 1914 and 1937. Drought conditions in the middle 1930's caused many cattle and horses to die on the range and forced Indian owners to sell more than usual numbers. Cattle and horse sales, in fact, more than doubled between 1935 and 1939. It was also during this time that the first serious attempts were made by the Bureau of Indian Affairs to introduce better range management practices and to influence the Indians to run fewer head of cattle of better quality. Pressure to reduce the number of horses, especially horses running wild on the reservation, also had an effect and, in addition, the number of horses was reduced because of a dourine infection which was not brought under control until the late 1940's.

[731]

175
233
657
433

The steady reduction in stock numbers was revealed in a ten-year comparison for the period 1949 to 1959 (Metzler, 1960, p. 55). The data also provides information on the size of the Papago ranges and the number of acres available per animal unit. See Table 12.

175
233

175
233

Table 12. Cattle and Horses Grazed
on the Papago Reservations, 1949 and 1959
as Reported by the Bureau of Indian Affairs

<u>Reservation and Year</u>	<u>Acres in Range</u>	<u>Total Animal Units</u>	<u>Acres Per Animal Unit</u>
Sells			
1949	2,761,471	21,626	127
1959	2,755,686	17,487	158
San Xavier			
1949	69,232	899	77
1959	69,232	682	101
Gila Bend			
1949	10,172	235	43
1959	10,195	70	145
Totals			
1949	2,840,875	22,760	125
1959	2,835,113	18,239	155

175
233311
[422]
[312]

The present distribution of cattle and horses on the reservation shows that livestock ownership is spread much more evenly over the reservation than formerly. A probable explanation for this modified distribution is the far larger number of wells now available, permitting the running of cattle in areas formerly unusable. This is a more advantageous use of the reservation resources, of course, since it permits less intensive grazing of each location and less damage to grass cover. A comparison of the grazing units calculated from Clotts' 1914 data (Table 11)² with current figures (Table 12) shows the nature of the change in cattle distribution. There are now increased numbers of ²_λ [see p. 72--Ana NST]

cattle in the Schuk Toak and Hickiwan districts. Other districts, on the whole, are running far fewer numbers of livestock than in 1914. A slight decrease is shown for the number of cattle in the Baboquivari and Chukut Kuk districts between 1914 and 1962 where cattle growers now own about 29 percent of all cattle on the reservation (See Map 7). It will be recalled that growers in these two districts held about 45 percent of all reservation cattle in 1937.

195
233
311 ●

In attempting to summarize the present extent and importance of stock raising on the Papago Reservation, more detailed data are available than for the past, but an accurate count of the numbers of cattle and horses on the reservation is still not available. However, increased cooperation of tribal leaders and the establishment of cattle associations (in San Xavier, Plainino, Hickiwan, Gu Achi, Sif Oidak, and Baboquivari districts) is making it possible to obtain increasingly dependable records.

233
128[595]
[422]

The 1962 record of grazing units, and the "authorized carrying capacity" of the main reservation are shown in Table 13. In regard to capacity of the range, it should be pointed out that this was established in 1944 on the basis of work which was conducted some years earlier.

233
311
634
[128]

233
311
634

Table 13. The Distribution of Stock Units
on the Main Reservation in 1962
Compared with the Estimated Carrying Capacity

<u>District</u>	<u>Stock Unit Capacity</u>	<u>Stock Units</u>	<u>Cattle</u>	<u>Horses</u>
Baboquivari	1,780	2,261	1,639	498
Chukut Kuk	1,064	2,440*	1,590	680
Gu Achi	1,000	1,532*	1,000	426
Gu Vo	469	1,085*	610	380
Hickiwan	939	2,062*	1,000	830
Pisimino	1,003	1,980	1,470	408
Schuk Toak	2,102	1,799*	900	560
Selle	1,067	2,022*	1,210	630
Sif Oidak	880	861	464	318
Totals	10,304	16,070	10,082	4,770

[115]
[128] Robert Roether, one of the major cattle buyers on the reservation, is of the opinion that the above estimates are too low for cattle and too high for horses.

233
422 Fully as important as the number of cattle and horses grazed, is their ownership. All cattle on the reservation are owned by Indians and, except for 200 head in a tribal herd, ownership is by individuals and families. No actual records are kept of individual holdings, although the tribal office keeps a record of sales by individuals. The Bureau of Indian Affairs now estimates that at least seven families have from 200 to 600 head of cattle each, that about ten families have 100 to 150 head, and that most families have about ten head or less. The number of individuals and

[217]

* Because no livestock count figures are available, these numbers are estimated.

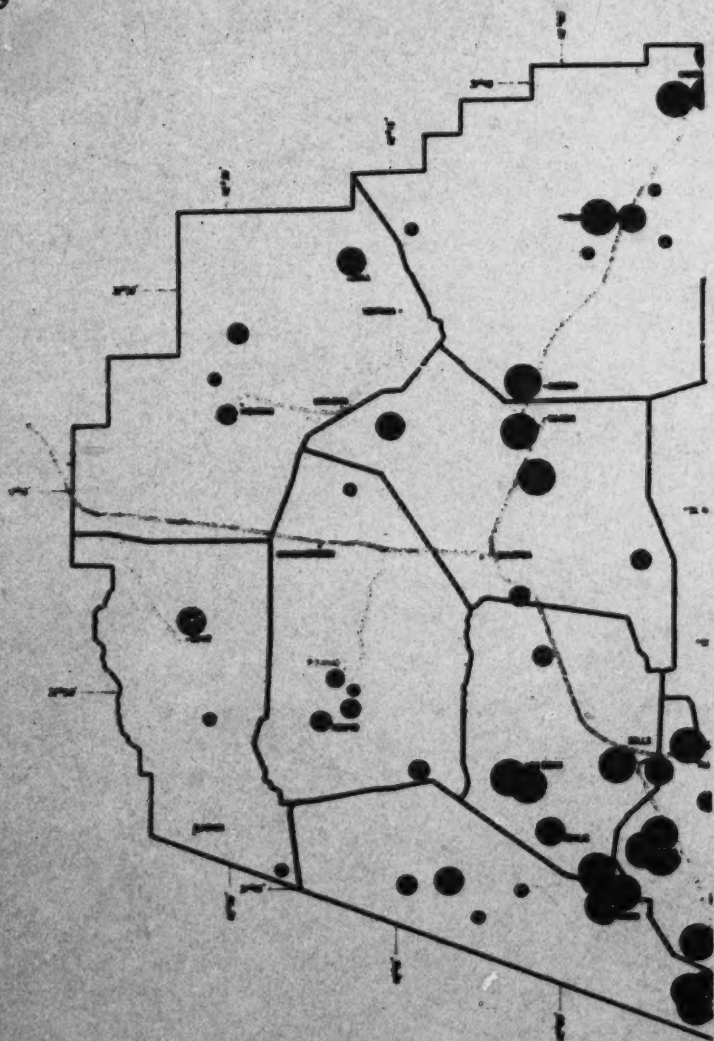
102

241

311

634

175



[A-78-A1]

102

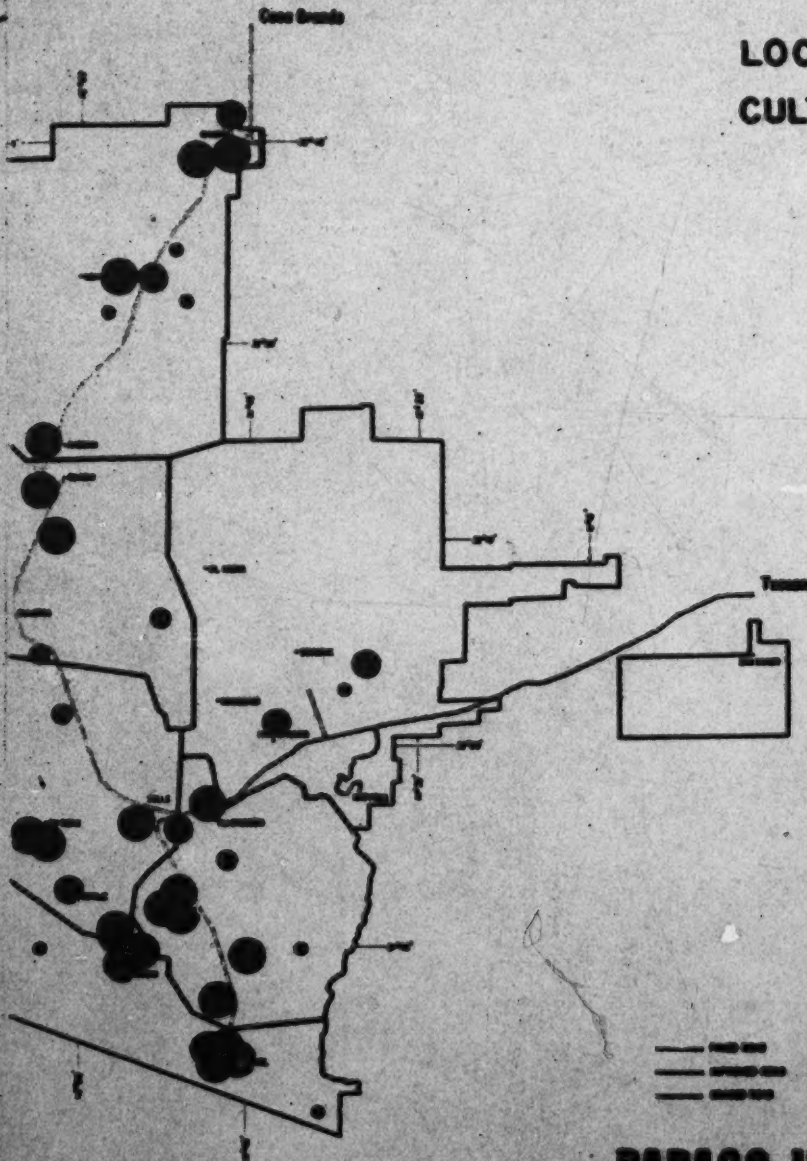
241

311

634

125

Coca Grande

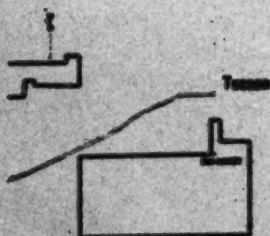
LOCAL
CULTURE

PAPAGO IN

[70-12]

102
241
311
434
175

MAP 6
LOCATION AND SIZE OF
CULTIVATED FIELDS 1914
(FROM CLOTTS)

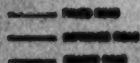


• APPROX. 25 ACRES

• " 75 "

• " 150 "

• " 250 "



PAPAGO INDIAN RESERVATION

1963

[P-78-A3]

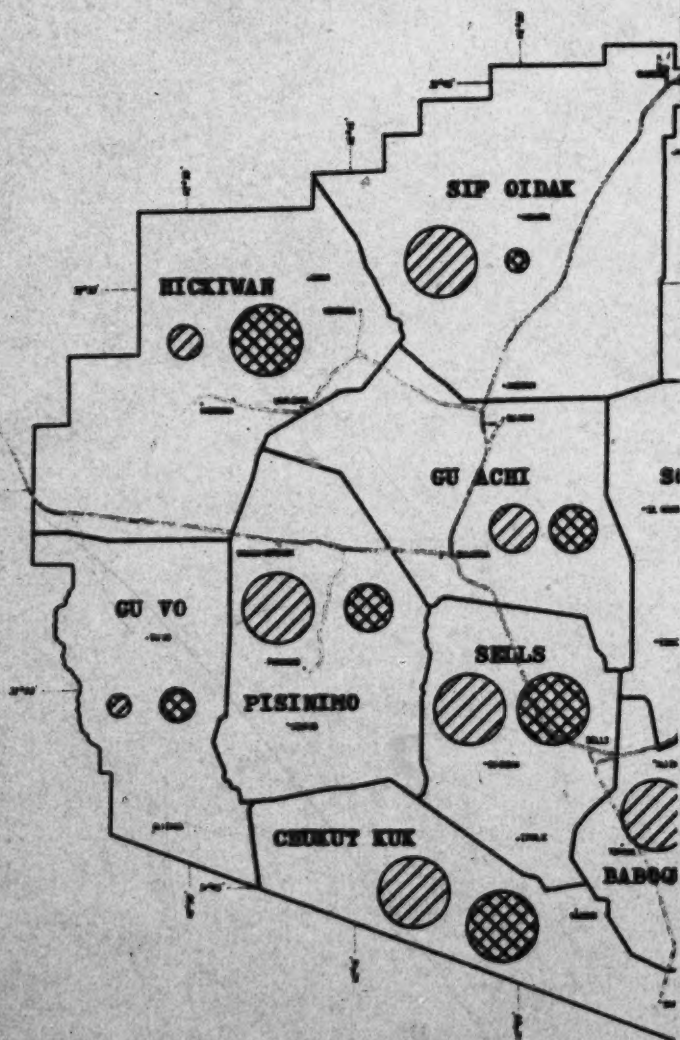
102

233

311

634

175



[p. 78-B1]

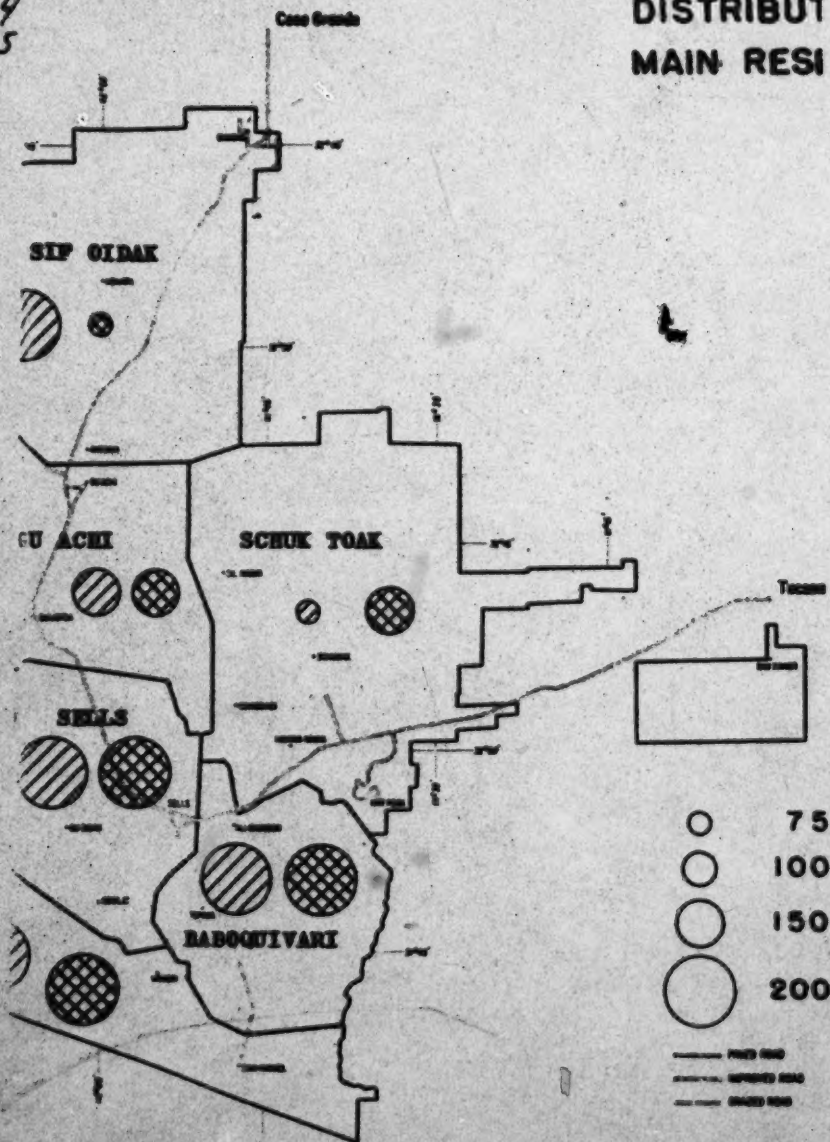
102

233

● 311

634

175

DISTRIBUT
MAIN RESI

PAPAGO II

[P 78-B2]

102

233

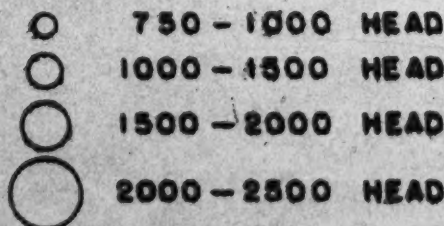
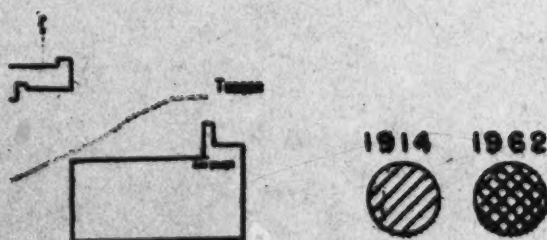
311

634

175

MAP 7

DISTRIBUTION OF LIVESTOCK ON MAIN RESERVATION 1914 & 1962 BY DISTRICTS



— ROAD
— RAILROAD
— CANAL

PAPAGO INDIAN RESERVATION

1914

[4-78-B3]

trained management and the use of fertilizers, insect control²⁴¹
and expensive farm equipment and water pumps.

Flood water farming, as it has been practiced since prehistoric days on the Papago Reservation, consists of the use of surface runoff of rain water at those spots where it could be collected and spread, either at the mouth of an arroyo or along stream beds in the larger valleys. Various names have been used to describe this technique: "akohin farming" (akohin being the Papago word for the mouth of an arroyo), "flash flood farming," and "dry farming." Actually, ^[177] since the introduction of wheat by Europeans, dry farming, which depends directly upon moisture from rainfall, has been used by the Papago in raising winter wheat. Corn, beans, and squash, however, which must be grown in summer, depend upon flood water which can only be supplied by the artificial spreading of moisture from intermittent streams.

Periodic surveys and estimates made by the Bureau of Indian Affairs show that flood water farming on the main reservation has steadily declined during the past 50 years. How far the decline has gone, however, is not known. In an effort to secure this information the Bureau of Indian Affairs has been systematically carrying out a farm survey during the past five years. Thus far, only the southeastern part of the main reservation has been surveyed (Chukut Kuk, Baboquivari, and the southern part of the Sells district).

241
178
657
127

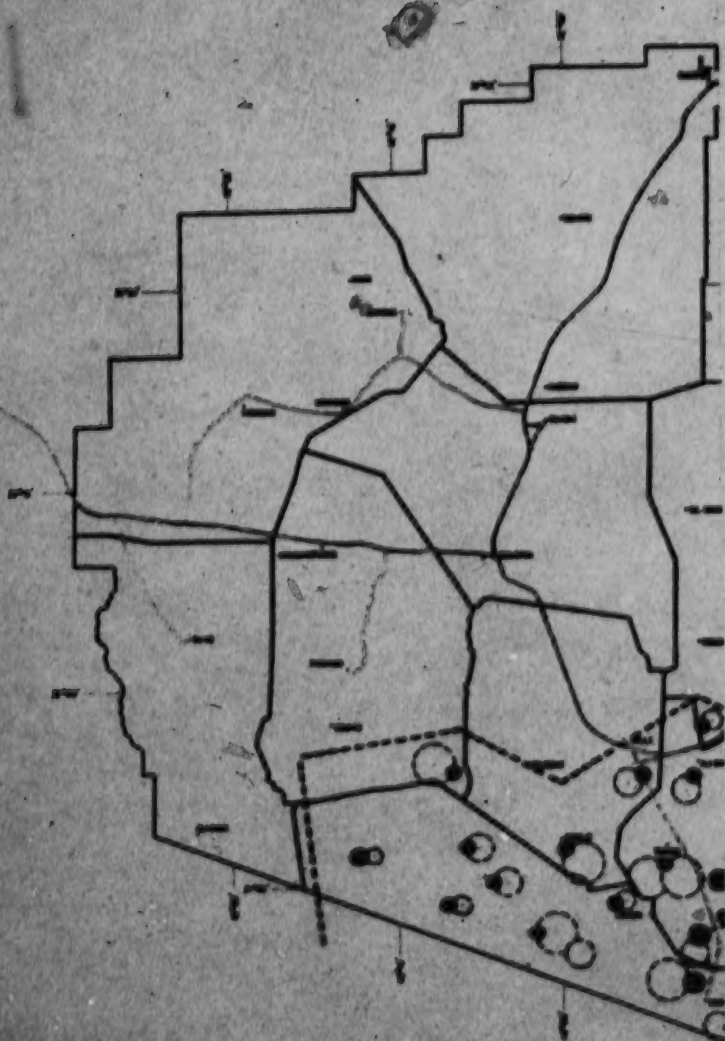
[311]
[107]
[634]

241
311
634 The survey records 536 acres that are now being farmed, or have very recently been farmed, out of a total of 4,466 acres available for flood water farming in this area. The location and approximate size of these plots, both farmed and idle, are shown on Map 8.

241
178 Although yields could not be determined, the crops grown on many plots were recorded, indicating an overwhelming preference for corn, beans, and squash, the ancient and traditional food crops of prehistoric Indians in the Southwest. Watermelons, wheat, milo, peas, and a few other crops, are grown in very small quantities. Thus the chief function of these farms is subsistence which, in fact, is a return to earlier times since as recently as 20 years ago cash crops of winter wheat were grown on much of this same land.

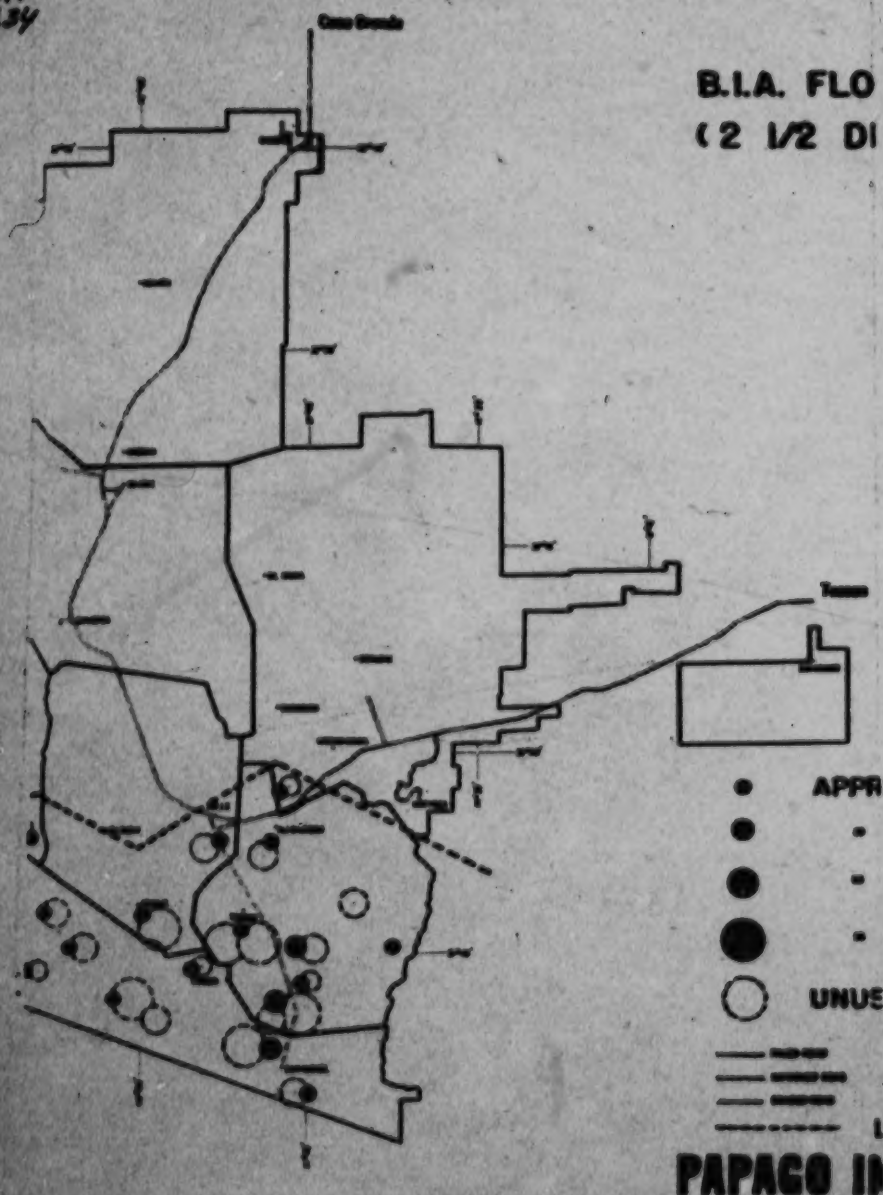
[114]
[101]
[311] In an effort to determine whether or not a similar decline in flood water farming has occurred in other areas of the reservation, a brief study was made by the Bureau of Ethnic Research in the Santa Rosa, Chuichu, and Gu Vo areas. The situation as it exists in the southeastern section of the reservation was found to be the same in these areas. Individual farmers were working less than ten acres each and often only one or two. In each case there was a reduction in the size of family plots when compared with former years and, as in the southeast, many families had abandoned flood water farming altogether.

101
102
291
311
634



[A-82-A1]

101
102
241
311
134



101

102

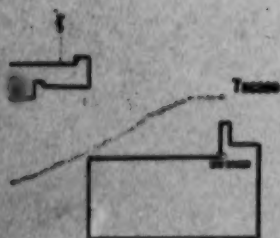
241

311

634

MAP 8

B.I.A. FLOOD WATER FARM SURVEY
(2 1/2 DISTRICTS COMPLETED)

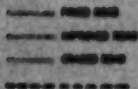


ACRES FARMED 1959, '60, '61

- APPROX. 25 (1-50)
- " 75 (51-100)
- " 150 (101-200)
- " 250 (201-300)



UNUSED ACREAGE IN PLOTS



LIMIT OF SURVEY

PAPAGO INDIAN RESERVATION

1963

[12-13]

A series of dry years, culminating in a serious drought during the summer of 1962, may, however, account for some of the reduction in flood water farming. In the Santa Rosa area where four farmers were interviewed, acreage had been cut from 125 to 25, and five of the 25 acres had been abandoned after planting in 1962 on account of the drought.

241
311
178
[115]

In the Chuichu area five farmers were interviewed. Thirty-one, out of a possible 50 acres, were being farmed. In the Gu Vo area a few farmers had attempted to farm from three to four acres each but lack of rain had forced them to give up the attempt.

[115]

Crops grown in the above areas were the same as elsewhere. The major crop was beans, followed by corn, squash, and watermelons. Other crops included wheat, barley and sugar cane.

241

The significance of the Indian Service farm survey in the southeastern corner of the reservation is greatly enhanced by a previous careful survey, that of Clotts in 1914. The fields and their approximate acreages are shown on Map 6.² For the entire reservation Clotts recorded 9,177 acres devoted to flood water farming. For the area covered by the recent survey Clotts recorded 5,537 acres being farmed. The recent BIA survey shows that only 536 of these acres are now being farmed and that the amount of land that could be

241
311
178

7 [See map on R 98-A1, A2 and A3 - Analyst]

241
311
178

farmed is now 3,930 acres. In other words, only 10 per cent of the land formerly used is now being put in crops.

It may be assumed from our survey, and from other evidence, that this situation holds true for the entire reservation. A current estimate of about 1,000 acres in flood water farming is probably fairly accurate.

241
433
178

The reduction in acreage is not surprising. The thing that is difficult to understand is that there should still remain two or three hundred individuals willing to endure the hardships and the failures inherent in flood water farming. In 1914 there were few off-reservation jobs, and fewer Indians willing to leave the reservation in search of work. Farming, however unrewarding, was required to sustain life. This situation is no longer true except for some men, usually the older men, who cannot, or do not, participate in off-reservation wage work.

[887]

241
311

Irrigated Farming. During calendar year 1962, Papago Indian farmers grew crops on 740 acres of irrigated land on the main reservation at Chuichu and on 45 acres of irrigated land at San Xavier. Gross income was \$94,755, [434] [248] more than half from approximately 120 acres planted in cotton.

241
311
178

Since 1952 the number of acres farmed by Indians at Chuichu increased from 930 to 1,360 (1957) but has now

dropped to 740. The number of acres farmed by Indians at San Xavier has decreased from 1,125 to 45. New land has been put into cultivation at Chuichu. At San Xavier, land previously farmed by Indians has been transferred to non-Indian lessors or now lies idle.

On the three Papago reservations, 5,275 acres of land in four areas have been developed for irrigated farming: 1,307 acres at San Xavier, 370 acres at Gila Bend, 1,678 acres at Chuichu, and 1,920 acres at Papago Farms. During 1961 the lease at Papago Farms, which had been given to a non-Indian corporation for development purposes, was cancelled and the land was idle until the summer of 1963 when the Bureau of Indian Affairs planted 160 acres in small grains and forage crops as an experiment. For details of farming in the other three areas see Table 14 and Table 15.

241
 311
 563

Table 14. Irrigable Land Use and Acreages
Farmed by Papago and Non-Indians,
Papago Reservations, 1955-1962

Irrigated Areas and Use	Calendar Year							
	1955	1956	1957	1958	1959	1960	1961	1962
<u>San Xavier</u>								
Irrigable Acres	1,376	1,225	1,225	1,225	1,284	1,290	1,307	1,307
Acres Irrigated	677	399	643	525	775	964	942	532
By Papago	677	399	371	288	120	88	105	45
By Non-Indians	-0-	-0-	271	237	655	876	854	487
Acres Idle	699	886	583	700	509	326	259	775
<u>Chuichu</u>								
Irrigable Acres	1,612	1,669	1,678	1,678	1,678	1,678	1,678	1,678
Acres Irrigated	1,324	1,288	1,360	1,034	1,028	560	1,095	740
By Papago	1,324	1,288	1,360	1,034	1,028	560	1,095	740
By Non-Indians	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Acres Idle	288	381	318	644	650	1,118	583	938
<u>Gila Bend</u>								
Irrigable Acres	212	385	380	346	346	346	480	370
Acres Irrigated	212	385	380	346	-0-	73	160	321
By Papago	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
By Non-Indians	212	385	380	346	-0-	73	160	321
Acres Idle	-0-	-0-	-0-	-0-	346	273	320	49

Table 15. Acreage and Value of Crops Grown
on Irrigated Land in 1962, Papago Reservations

Crop	Chuichu		San Xavier				Gila Bend	
	Indian Acres	Value	Indian Acres	Value	Non-Indian Acres	Value	Non-Indian Acres	Value
Garden	5	\$ 2,500	17	\$ 8,500	31	0	0	0
Cotton	115	47,840	8	3,000	246	\$ 82,900	61	\$ 23,000
Small Grains	200	15,975	20	740	210	19,230	260	17,342
Forage & Pasture	400	16,000	0	0	0	0	0	0
Totals	740	82,315	45	12,440	487	102,130	321	40,342

Gross value of Indian crops \$ 94,755

Gross value of Non-Indian crops 142,472

Gross value of all crops 237,227

The history of irrigated farming at San Xavier and at Chuichu goes back to pre-Spanish times. The San Xavier area was described by Juan Mateo Manje, who visited there in 1697 with Father Kino:

"Here the river runs a full flow of water, though the horses forded it without difficulty. There are good pasture and agricultural lands with a canal for irrigation. The Indians harvest corn, beans, and cotton from which they make cloth to dress themselves. Squash, melons and watermelons were also raised. We counted 800 souls in 186 houses."
(Karna, p. 92)

Subsistence farming with irrigation from stream flow continued at San Xavier until 1912 with the number of acres

24
311
435
563

175
241

[33]
[286]
[62]

175
241
311

175
241
311
[312] planted by Indians ranging from 800 to 1,200. By 1916, with water no longer available from the Santa Cruz River, 1,320 acres were irrigated with water from three wells. Indian farming continued at about this scale until 1953 when the present abandonment of farming by Indians at San Xavier commenced. In 1956, as shown in Table 14, a total of 886
[427] acres lay idle. The answer was a program for leasing San Xavier farm land to non-Indians which commenced in 1957.

241
463 During 1962 a total of 12 San Xavier Indians were engaged in farming, but mostly in small garden plots. The smallest of these was one half acre in size.

175
241
311
312 Indian farming at Chuichu has had a somewhat different history. Although known to have taken place, pre-Spanish farming in this area has not been specifically reported. The first report on the area is from Oletts (1915), who reported that 188 acres were being irrigated from the Santa Cruz River, but that the building of a canal to Green's Reservoir up stream had cut off a part of the water to Papago fields. Commencing in 1931, deep wells were drilled to supplement and replace the river water and, by 1937, 619 acres were developed for irrigation. In 1955, through the leveling of additional land and the drilling of new wells in an area just east of Chuichu, the Bureau of Indian Affairs made a total of 1,612 acres available to Indians. See Table 14.

The rapidity with which the level of ground water in the Casa Grande Valley is being lowered now threatens the life of the entire Chuichu project. During 1962 the one remaining productive well on the west side was choked with silt during an early fall flood on the Santa Cruz, reducing its capacity from 750 to 250 gallons per minute. Since this well had already been drilled to bedrock at 230 feet, and the water level had sunk to within 20 feet of this point, it was decided not to redrill the well. The result will be the abandonment of all farming on the west side and the transfer of Indian holdings (a farming cooperative) to idle land on the east.

241
133
312
311 ●

Even the eastern section, developed after 1955, is threatened with the lowering of the water table at a rate that may cause its abandonment during the next decade.

During 1962 five Indian farmers were growing crops in the eastern section. In addition, the East Chuichu Project (an Indian cooperative) farmed an area of 80 acres of which 40 were planted in cotton. During 1963 the 65-acre cotton allotment on the western side was moved to the eastern section and management of the new land turned over to a non-Indian operator.

248
311
[474]

Development of irrigated agriculture at Gila Bend and at Papago Farms has always depended upon leases to

241
311
427

241
311
429 non-Indian farmers. Papago Farms is a new development in an area in the western section of Chukut Kuk district which had never been farmed commercially before 1958. A total of 7,500 acres of tribal land was leased in 1957 to a corporation for a ten-year period under a plan that called for ultimate development of 5,600 acres. From 1958 through 1960 the company reported 1,920 acres under cultivation. The following year no crops were planted and the lease was cancelled.

241
311
653 The Papago Tribal Council is now working on a plan to bring this area into cultivation as a tribal enterprise. A similar tribal project is contemplated for the development of 2,000 new acres of irrigated land near the proposed Tat Momolik Dam southwest of Chuichu.

651 Tribal income from farm land during 1961 was derived entirely from the agricultural lease at Gila Bend where non-Indian lessors paid a rental of \$4,000 from a gross crop revenue of \$22,720.

241
311
657 History and Prospects. Papago agriculture has never lived up to its promise. In 1949 the Bureau of Indian Affairs published a Papago Development Program which was the product of joint planning by Indian leaders and Indian Service technicians. At that time it was suggested that irrigated agriculture could be developed on about 16,000 acres of land at Chuichu, San Xavier, and Gila Bend. At that time there were 2,425 acres actually being farmed on

the three reservations. Thirteen years later, in 1962, the amount of land used had decreased even though, at San Xavier, non-Indian farmers had been brought in to use idle land. Falling markets, a falling water table, and rising costs are perhaps the principal contributing factors in the failure to proceed with plans for the development of Chuichu. The almost complete abandonment of farming by San Xavier families has not been explained. Relatively small Indian holdings, continued division of the land among heirs, and the preference for wage work over subsistence farming are probably the primary contributing factors.

The prospect for a greater development of agriculture on the reservations has not, however, been abandoned by the Indians nor by students of agricultural economics. Mr. William H. Metzler, who conducted a study on the reservation during 1958 and 1959 for the Department of Agriculture, has estimated from a preliminary report by the U. S. Geological Survey that about 15,000 acres of land on the Papago Reservation could be irrigated from deep wells. He goes on to say (Metzler, 1959, pp. 46-7):

"Less than one per cent of the approximately 3,000,000 acres in the reservation is adapted to crop production. Probably half of these 30,000 acres could be irrigated, the rest could be made suitable for flash flood farming. It is probable, however, that the Papagos do not need that much land for flood plain farming. Probably fewer than 300 families would engage in it and most would require only three to five acres each.

241
311
659
[82]

241
311
182

000

311
[14]

[34]

000

246
134
[211]
000

"Some Papagos, however, have discovered a wider use for this type of farming. Some families have as much as 40 flood-plain acres devoted to the production of grain and forage crops for their livestock. Since this type of use is feasible, productive use of the entire flood-plain acreage on the reservation might be made.

"The tools and techniques used in flood-farming can be greatly improved so as to reduce the time required for constructing dykes and ditches, and for plowing, planting, weeding, and harvesting. . .

"A much sounder type of agriculture for the Papago family is irrigated subsistence farming. It fits in with their tradition of small farms and home food production. But it also assures adequate amounts of moisture and the timing of application so as to guarantee good yields. It would combine well either with off-farm employment or with livestock production."

Whether or not such a development as Mettler visualizes could be brought about will depend upon the cost of pumping water from deep wells (see Ground Water Report, page 27). It will also depend upon new regulations, opportunities and ideas with respect to land tenure, capital expenditures, and credit, not to mention the attitudes and interests of Papago Indian families. The present generation of Indian farmers, with few exceptions, have not been successful in industrialized large-scale farming. From two to three hundred Papago families have, however, continued to grow subsistence and feed crops on small flood water farms as a source of supplementary income. It is possible that some of these farmers would welcome a more stable farm income through the development of small irrigated plots, and that

241
[434]
000

197
464
648
decades of tutelage by the Indian Bureau and tourists. And more Indians were affected than ever before—a quarter of the hitherto ultra-isolated Navahos; all the men in some Pueblos in New Mexico. Defense workers and servicemen learned new standards of living and new modes of behavior.

161
[433]
At the war's end they returned to inadequate reservation lands. For Indian population in the Southwest had leaped far beyond the human carrying capacity of the reserves—small remnants of original Indian territory held in trust for them by the government. While many smaller tribes stabilized at their size of 50 years ago, larger groups are rapidly increasing even though Anglo immigration submerged the total Indian minority ever deeper.

311
433
197
221
[464]
At the same time the Southwestern Indian land base deteriorated in quality so it could support fewer people, because of overgrazing, erosion, and other causes.

[182]
"Faced by these increasing difficulties, many Papago families began regularly to migrate off the reservation to pick cotton and engage in other seasonal wage work during the winter months, while they retained permanent homes in their 'fields' villages where they spent the remainder of the year farming and herding. In time a new dual residence and economy pattern developed among the Papago. By reinforcing the rhythmic balance of traditional culture and personality structures the new pattern apparently met, to a certain extent, both immediate economic needs . . . and deep-rooted socio-psychological needs for security and opportunity for constructive development."²

²Thompson, 1951, p. 71.

W40--this report is about--Papago Indians

101
[121]
[199] This report is concerned specifically with the role in the southern Arizona cotton harvest of over 7,000 Papago Indians who live along the Mexican border. These natives speak a Piman language closely related to others spoken from the Gila River south to the border of Sinaloa in Mexico. They call themselves the Tohono Au'utam, The Desert People.

101
36
131 A few hundred Desert People live on the Mexican side of the border. Some inhabit Indian rancherias--villages with houses scattered barely within sight of each other--close to the frontier, and have contacts with American Papagos. Others eke out a parasitic existence around towns of Mexicans who have taken their lands. They are said to have given up their Indian heritage and are waiting passively to die.

101
[186]
[464]
[199]
[891] The thousands of Desert People in the U. S. are a people with hope and pride in being Indian. A few hundred make a living in low paid jobs in Anglo cities. They have chosen to break away from their Indian heritage in an endeavor to give their children a head start as citizens of wider Anglo-American society, especially by affording them a formal education in public schools.

657
423
[131] Most of the Desert People, however, live in rural semi-desert areas reserved for them by the U. S. from their former territories. The San Xavier community was reserved some of its lands in 1874 by Presidential Executive Order. This 71,090 acre reserve slices through the Santa Cruz River bottoms, and could once be irrigated with surface flow (until Anglos started erosion that cut the channel--and the water table--20 feet below surface) and now is irrigated from wells. Most of it was allotted to individuals, and the useable agricultural and range land is now mostly in heirship status. That is to say its use is amazingly and cripplingly complicated by the fractionalisation of holdings through inheritance. Fortunately, the San Xavier community continues to recognize old use-rights more than the legal allotment system.

131 A few Desert People live on a tiny 10,235 acre
657 reserve at Gila Bend set aside in 1912 by Executive
312 Order--leaving the village outside the reserved
[311] areal. Some of this land could once be irrigated
by surface flow from the Gila River which is now
impounded far upstream, and none is farmed now.

A few Papagos live on the Maricopa Indian
Reservation upstream under the Pima Indian Agency
on lands partially irrigated by pumps tapping the
underground flow.

The greatest number of the Desert People live
on the 2,773,896 acre Papago Indian Reservation
running north from the Mexican border within a few
miles of the Southern Pacific Railroad. Only a few
hundred acres at the northern tip of the reserve
projecting into the Gila River valley can be irri-
[133] gated by pumped water. There is no running surface
[43] stream in the entire area. An irrigation of sorts
using flood waters from late summer rains has been
practiced for unknown centuries by the Desert
People to raise subsistence crops to supplement
the surprising variety of foods gathered from the
desert plants or hunted. Water under this reserve
is too deep and too scarce for economic irrigation.
[185] "To many Papago a good field, enough cattle to
provide occasional meat and money, a few horses
for prestige, and plenty of rain would make the
ideal combination."

¹Joseph, Spicer & Chesky, 1949, p. 59.

WHERE ? . . . Two Counties

464

The Desert People do not go far afield seeking work. They hire out to farmers in the river valleys north and east of their reservations in Pima and Pinal counties, Arizona. Most of the cotton grown in these two counties is planted on the flood plain of the Santa Cruz River.

133

The Santa Cruz rises in the U. S., swings all the way around in Mexico and flows northward and westward across southern Arizona to the valley of the Gila River which rises in New Mexico to the east, flowing westward to the Colorado River. These streams are located in part of the Basin-and-Range physiographic province, where broad flat valleys are separated by steep volcanic mountains. The arable land in the Santa Cruz valley is restricted by mountains in the upper reaches, widening out into the tremendous Gila valley.

000

Some cotton is grown in Santa Cruz county, between Mexico and Pima county. Harvesting is done by local labor or Mexicans. Cotton is grown northward along the narrow river flats for a few miles between the county line and the San Xavier Indian Reservation. This is the Sahuarita-Continental area, so called after the two tiny villages located there. A small cotton gin operates at Sahuarita. The reservation and other uncultivated lands separate this area from the small farms, some of them growing cotton, around the city of Tucson on the Santa Cruz north of the San Xavier reservation, and on Rillito Creek which flows eastward from the Santa Catalina-Rincon mountain system to empty into the Santa Cruz.

This small-farm area, which is being taken out of farming into suburban home-sites for rapidly growing metropolitan Tucson, extends northward just past Jaynes Station. Desert intervenes between it and a small cultivated area at Rillito, which is properly a southern extension of the Marana farming region, but still separated from it by desert.

[Text Continues on P. 17]

ECONOMIC NECESSITY

Basic reasons Papagos Work--

433 In a rural area, there are not many choices of
[463] livelihood--farming, mining, lumbering, raising cattle.
[659] The Papago reservations have no timber worth cutting
[313] other than mesquite trees for firewood. The Papago
[316] reservations are the only lands in the U. S. reserved
[464] for Indians which are open to mineral entry by out-
siders. Consequently mining claims are held by non-
Papagos, and profits go elsewhere. The only way the
Desert People can benefit from mines is by selling
their labor to the owners.

241 Farming is risky for the Desert People. Only two
311 communities have irrigated lands which can be depended
433 upon for crops. The rest must resort to age-old tech-
niques of flood farming where arroyos spread flood
waters from mountains. Spots that can be farmed this
way are not abundant. They are being decreased each
summer as gullies wash out fields and arroyos cover
them with sterile sand and gravel washed down from over-
grazed and eroding slopes above. Flood farming was
never more than a subsistence measure because of the
size limitation on fields, and frequent crop failures
from flooding out, frost, or drought. Today, there is
little incentive to gamble on a subsistence farm for any
Papago able to speak enough English to get a job. For
wage labor means a super-subsistence income, even if a
substandard one by Anglo lights.

[464] Probably every worker on the Papago reservations
[511] has noticed the steady abandonment of flood farms. A-
241 mong Papago cotton pickers with these farms, less than
433 half apparently bother to plant any crops at all nowa-
464 days. Cotton picking starts just about the time fields
221 need weeding on the reserves, and picking season hits
its peak just about the time flood field crops are ready
to harvest. This conflict between flood-farm growing
season and wage-labor season in the cotton fields re-
sults in many Papago laborers not planting crops at all
on the reserves.

433 Another factor discouraging flood farm planting is
241 that these small plots produce only subsistence crops
461 at best, even if the gamble against drought and over-

16 families of 11 giving information had any crops at
all in 1950.

CONDITION OF INDIANS—ARIZONA.

141

In the spring of 1890 the land was allotted to the Indians in severalty, and it may now be divided as to quality as follows:

	ACRES
Land that is farmed	500
Land that is not now farmed on account of deficient water supply	1,500
Timbered land allotted	5,000
Meat land, suitable for pasturage, allotted	20,000
Mountain land, including desert land that can be pastured 2 months in the year	20,000

The 1,500 acres not farmed on account of deficient water supply may be farmed when a better and more economical mode of irrigation is adopted than that now practiced by the Indians. The 5,000 acres of timbered land is what is usually called mesquite land, from which the Papagos procure their fuel and all considerable quantities from year to year. The 20,000 acres of mountain land is next to worthless.

There are 84 heads of families on the reservation, and a little more than 5 acres of farming land (land that is farmed) are allotted to each head of a family. The 500 acres of allotted land are surveyed and staked out. The area of land cultivated is diminished, and no progress is being made in methods of farming. Most of their income seemed to be obtained from the sale of wood sawed out on the reservation.

AGRICULTURAL PRODUCTS RAISED AND STOCK OWNED BY INDIANS FOR 1890-1894.

PRODUCTS, STOCK, AND LAND.	Number.	Value.
Total value of agricultural products		\$5,750
Bushels of barley	4,000	3,000
Bushels of corn	1,000	1,000
Bushels of vegetables	1,000	1,000
Wheat	200	20
Pumpkins	1,000	100
Tons of hay cut	100	1,000
Total value of live stock		4,000
Horses owned by Indians	200	2,000
Cattle owned by Indians	150	1,500
Domestic fowls owned by Indians	100	25
Acres under farm	10,000	
Woods made during year (cords)	7,000	

All of the Papago Indians living on reservations are in a village near San Xavier church. Their dwellings are mostly rude adobe, with dirt roofs and few windows, and are almost destitute of furniture except the most primitive. There are only 14 comfortable adobe houses. Many of the Indians own farm wagons, though their farming tools are rude and unserviceable. The men all wear the civilized dress; the women also wear dresses similar to those worn by the whites, but leave off their shoes on ordinary occasions. It is claimed that 250 of the Indians living on the reservation are members of the Catholic church.

STATISTICS OF THE RESERVATION PAPAAGO.

Whole number living on the reservation	200
Men	104
Females	179
Children under 1 year of age	20
Men	21
Females	12
Number married	100
Number over 50 years of age who can read	10
Number who can read and write	10
Number who can use English enough for ordinary conversation	20
Number of children of school age	20

SCHOOLS.—The Catholic church has provided 2 neat, well-furnished schoolrooms adjoining San Xavier church, which will accommodate about 70 pupils. A school was maintained there during the year 1890 by the Sisters of the order of Saint Joseph, without pecuniary aid from the United States. The average attendance for the year ending June 30, 1890, was about 20. In addition to elementary studies the girls were taught sewing, crocheting, knitting, and minor household duties. A few of them became quite skillful in operating the sewing machine. The great drawback to the prosperity of the school was the irregularity in attendance. The school was again opened in September, 1890.